Managing in flight emergencies

Earlier this year the dramatic story of a makeshift operation aboard an aircraft flying from Hong Kong to London hit Britain's newspapers. Here the surgeon who performed the in flight operation gives an account of what happened, and he and the other doctors who treated the patient assess the problems of managing medical emergencies in the air.

A personal account

W Angus Wallace

I was on board a Boeing 747 bound from Hong Kong to London and was seating myself before departure when a call was made by the stewardess: "If there is a doctor on board would they please make themselves known to the cabin staff." I offered assistance. A 39 year old woman in the back row of economy class had become concerned about the swelling developing in her forearm which another doctor, Dr Tom Wong, was examining as I joined him. She told us that she had fallen off a motorcycle on the way to the airport. She had been shaken by the accident and had missed her original flight before catching this one. The problem appeared to be bruising and a probable minimally displaced fracture of the right forearm. She did not complain of any other injuries, and though I had attended an advanced trauma and life support course in 1990, I did not carry out a full primary survey—there seemed to be no need, and it might have been misunderstood by the patient.

I decided that the forearm injury could be managed satisfactorily on board. I recommended that in the first instance the arm should be raised on a pillow and that more formal splinting could wait until after take off, to avoid any delay to the flight.

After take off, when the seat belt signs had been switched off, Dr Wong and I splinted the arm. Samsplint—a flexible aluminium and rubber based splinting material, a bandage, and a sling were all available in the plane's M5 medical emergency kit. A Hong Kong newspaper was used as additional padding. The splint was effective, the arm was elevated, and the passenger felt comfortable. I then completed a medical report with the air stewardess. All seemed well and we returned to our seats to enjoy our first meal on board.

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Planes are not ideal operating theatres

The first signs of real trouble

About 45 minutes later (more than an hour into the flight) I was told that the passenger had developed left sided chest pain, which she had noticed when she had bent down to remove her shoes. Examination confirmed tenderness of the lower left ribs with probable fractures of between two and four ribs.

An injectable painkiller was indicated for the rib fracture pain and this was sought from the emergency kit. The kit was well supplied with drugs and also included a guide on their recommended dosages. An injection of nalbuphine was prepared, but when I returned to the patient she was obviously ill. The injection was not given, and I re-examined her. She was in respiratory distress with mild tachypnoea. Chest percussion and auscultation could not be carried out effectively because of the engine noise but her trachea was significantly deviated to the right. I realised there was a serious problem and asked Dr Wong for a second opinion. He agreed with the findings and an oxygen mask was immediately applied.

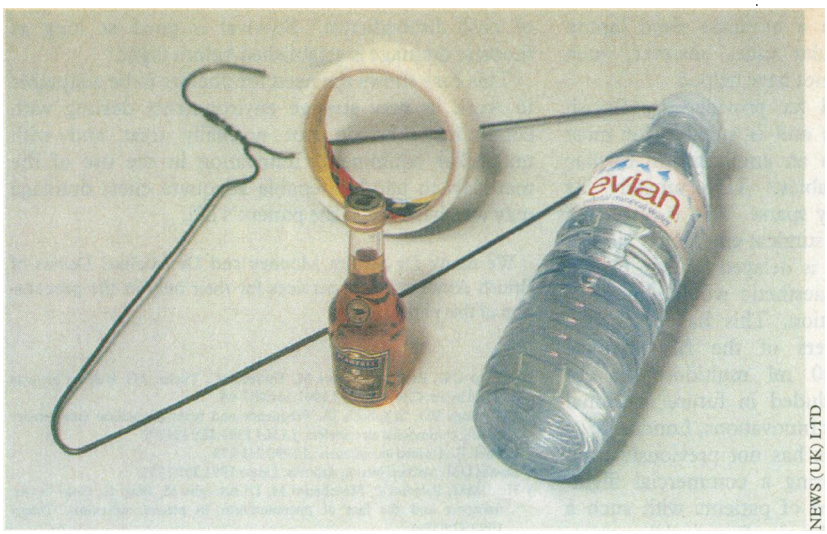
I then visited the flight deck and explained to the captain that the patient had a tension pneumothorax and asked if medical advice could be obtained from the ground, particularly advice on the available surgical equipment. It was not possible to receive immediate advice and I decided to proceed with surgery.

In flight surgery

The aircraft's medical kit had a scalpel, sharp pointed scissors, and a 14 gauge urinary catheter. Xylocard (100 mg of lignocaine in 10 ml) was available for use as a local anaesthetic, but in the heat of the moment, neither I nor Dr Wong were able to calculate the percentage of lignocaine in it.

There the routine equipment ended; we prepared heated hand towels for sterile drapes, a modified coathanger as a trocar for the urinary catheter, a bottle of Evian water with two holes created in its cap for use as an underwater seal drain, and a length of oxygen tubing to attach the catheter to the drain. In addition Sellotape was used to anchor the catheter to the oxygen tubing and five star brandy as a disinfectant for the introducer.

I advised the patient that she had a serious condition and that an operation was required, but she was too ill to give written consent. With the patient seated in her aircraft seat, the operation—the insertion of a chest drain under local anaesthetic—was performed. I planned to insert the chest drain into the left second intercostal space in the mid-clavicular line because this was the most accessible area and would control a tension pneumothorax. As soon as the drain was connected, air was released from the pleural cavity and within five minutes the patient had almost fully recovered. The patient was left sitting in her passenger seat and settled down to enjoy her meal and the inflight entertainment.



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In flight surgical equipment

I then had to prepare a full medical report for the second time, a task made difficult by the changing time zones. The air stewardess thought that we should document all the times in British Summer Time and this proved to be the best decision.

The patient was now comfortable, felt well and we retired to our seats to recover. Eight hours later I was again summoned by the stewardess to see the patient, who had developed more chest pain and dyspnoea.

I found her sitting on the toilet with the underwater seal drain on a high shelf. All the water and air had syphoned out of the bottle into the chest. The crisis resolved when I placed the underwater seal drain on the floor—draining the water back from the chest to the bottle. The air bubbled out of her chest when she coughed. After a few minutes she was almost back to normal, but exhaustion precluded the completion of a third full medical report.

Back on land

On arrival at Heathrow she was transferred from the aircraft by British Airways ambulance to Ashford Hospital. She was still mildly short of breath and complaining of discomfort over the left chest wall. Examination showed clinical evidence of a fracture of the left sixth rib in the mid-axillary line. A full blood count and arterial blood gases were normal. A chest radiograph revealed a 30% residual left sided pneumothorax; and our temporary drainage catheter had been inserted in the third intercostal space and was still in place.

She was given parenteral analgesia, intravenous antibiotics, and tetanus prophylaxis. The Foley catheter was removed and a 28 Fr chest drain was placed under local anaesthetic. A repeat radiograph showed complete lung expansion, and subsequent recovery in hospital was uneventful.

Discussion

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Meticulous screening and preparation of air travellers with known ailments would prevent most in flight emergencies if passengers at risk sought a medical opinion about their suitability for travel.[1] In the absence of declared symptoms, however, the prediction of a potentially fatal condition at altitude is difficult if not impossible in a young patient apparently fit to fly. A useful review of the particular medical risks to be considered before travel by air is provided by Skjenna.[1]

Medical emergencies among airline passengers and staff during flight are not common: serious in flight events occur once in every 753 flights (about 1 per 40 000 passengers).[2] In 1994 British Airways health services logged all 2078 medical incidents occurring on British Airways flights, ranging from headache to myocardial infarct. Most of these were dealt with by cabin staff without calling for help from a doctor or nurse on board. In 559 cases help was given by a doctor or nurse responding to such a call; 18 flights were diverted to allow a critically ill passenger to be treated at the nearest possible hospital.

Conditions on board

The conditions in the cabin of a commercial aircraft are less than ideal for assessing and managing any acute medical condition; this is especially true of a pneumothorax. At cruising altitude the cabin pressure is maintained at the equivalent of that at about 2500 metres (7000 feet); at this pressure the partial pressure of oxygen will fall in the normal adult to about 8·64 KPa. While this is still on the flat part of the oxygen dissociation curve for normal subjects it can represent a severe embarrassment to anyone with a cardiopulmonary problem giving rise to any appreciable degree of pulmonary shunting. Furthermore, the diminished pressure will lead to expansion of gas by about 30%, which if constrained within a cavity such as the thorax, will inevitably aggravate a pneumothorax.

An aircraft cabin is a particularly noisy environment. There is an excess of low frequency (<4000 Hertz) noise at sound pressure levels of about 65 dB; in some less refined aircraft it may be as much as 90 dB. With this degree of background noise a stethoscope is virtually useless.[3] It has been suggested that the best use for a stethoscope in flight is that it acts as a symbol by which the doctor can be identified.

The very nature of commercial airline travel is such that the nearest fully equipped medical facility is only as close as the hospital serving the airport of destination unless a patient's condition is deemed so critical as to warrant diversion—a disruptive event for every other passenger and a costly one for the airline. In this case the acute event occurred only one hour into a 14 hour non-stop flight from Hong Kong to London. The rapid increase in dyspnoea in this case indicates that diversion may not have been sufficiently rapid to prevent a fatal increase in intrathoracic pressure.

Promise of telemedicine

The carrier in this case (British Airways) is due to install telemedical links from its long haul flights to relay "vital signs" to physicians on the ground who can provide advice and support to the cabin crew and any doctors on board. Sensors from a monitoring unit are attached to the passenger. The unit is connected to the aircraft's satellite communication system through a socket in the arm rest of the passenger's seat. On the ground the signals are transmitted to the duty doctor

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